and duration of path will be found in the accompanying table.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	3, a.m.	48	108	6, a.m.	40	94	1,320	3.0	440	18.3
II	5, a.m.	53	109	8, p.m.	47	84	1,610	3.5	460	19.2
III	13, a.m.	48	129	18, p.m.	44	63	2,990	5.5	599	25.0
IV	20, p.m.	54	116	23, a.m.	48	98	910	2.5	362	15.1
V	23, a.m.	51	116	26, a.m.	37	74	2,330	3.0	778	32.4
VI	26, p.m.	47	104	28, p.m.	42	87	940	2.0	471	19.6
VII	29, a.m.	54	110	31, p.m.	44	81	1,560	2.5	624	26.0
Sums							11,660	22.0	3,734	
Mean of 7 paths									533	22.2
Mean of 22.0 days									530	22.1
Low areas.										
I	1, a.m.	52	103	5, a.m.	43	72	2,240	4.0	560	23.3
II	6, a.m.	52	117	8, p.m.	51	98	870	2.5	347	10.9
III	6, p.m.	29	93	10, a.m.	47	86	1,650	3.5	471	19.7
IV	8, p.m.	50	110	11, a.m.	54	102	610	2.5	244	10.2
V	13, p.m.	50	106	16, p.m.	48	61	2,160	3.0	720	30.0
VI	15, p.m.	52	115	19, p.m.	41	90	1,870	4.0	468	19.5
VII	18, p.m.	52	112	21, p.m.	49	63	2,480	3.0	827	34.5
VIII	20, a.m.	48	111	23, p.m.	48	58	2,690	3.5	770	32.1
IX	20, p.m.	46	117	25, p.m.	44	64	3,330	5.0	667	27.8
X	24, a.m.	54	107	27, p.m.	42	83	1,860	3.5	531	22.1
XI	27, p.m.	50	116	31, p.m.	46	59	2,790	4.0	697	29.0
Sums							22,550	38.5	6,302	
Mean of 11 paths									573	23.6
Mean of 38.5 days									529	22.0

LOCAL STORMS.

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

There were about the usual number of local storms, torrential rains, and damaging hailstorms during the month. No remarkable tornadoes occurred, but possibly some of the local violent winds were really incipient tornadoes. Minor tornadoes were reported in North Carolina and Virginia on the 8th, and in South Carolina on the 15th. Very severe local storms were experienced in Michigan, Iowa, Ohio, and Pennsylvania on the 26th and 27th, and damaging hailstorms occurred in South Dakota, Iowa, and Indiana on the 26–27th. The loss to crops in South Dakota on this occasion probably exceeded $100,000. Careful estimates of loss in Iowa in the counties of Woodbury, Cherokee, Plymouth, Ida, Sac, Buena Vista, and Calhoun place the damage to crops at $200,000.

The record by dates follows:

4th.—A severe squall wind passed over Cedar Point about 3 miles northeast of Sandusky, Ohio, capsizing a number of yachts and pleasure boats. One person was drowned.

6th.—Bucklin, Ford County, Kans., was visited by a severe wind, rain, and hail storm, reported as moving toward the southwest. The width of the storm was about 5 miles; its length was probably not over 15 miles. The damage was confined to windmills, small buildings, fruit crops, and poultry.

7th.—A severe windstorm began on the west Florida coast on the morning of the 7th, increasing in force as the day advanced. The maximum velocity of the wind at Pensacola (72 miles per hour from the southeast) was reached at 11.45 a. m. Much damage was done in that city. About 35 houses were unroofed, and there was a general destruction of signs, awnings, telegraph and telephone wires, smokestacks, windmills, etc. The greatest destruction, however, occurred in the harbor, and on the water front. Nine fishing smacks were sunk; one brig dragged her anchor and was washed ashore; two barks were badly damaged and a number of smaller craft wrecked and sunk. The property loss has been estimated as high as $400,000 in Pensacola alone, but that statement seems excessive. Probably $100,000 would be nearer the true figures. Strong winds were also reported at Eufaula, Ala., and Winston, N. C.

8th.—An incipient tornado formed in Halifax County, N. C., at 9.30 a. m., and moved northeastward in a path about 60 or 70 feet wide. At Spring Hill several houses and a number of outbuildings were blown down: one person was killed. Length of track uncertain, but probably not over 10 miles. The property loss was about $1,000. Later in the day what appears to have been a series of minor tornadoes was observed in Dinwiddie and Prince George counties, Va. Reports as to the general direction of the storms are somewhat conflicting. The observer at Reams Station reports a storm moving northwest. Two independent reports from Templeton almost due east of the first-named point give the direction as "a little east of north" and "north," respectively. The observer at Disputanta reports the storm as moving northwest. Funnel clouds were also seen moving in a northeasterly direction toward Williamsburg; 5 persons were injured; property loss about $1,200. The path of the main storm varied in width from 50 to 200 yards; its length was probably 20 miles, but there was no destruction over a portion of its course.

14th.—A heavy wind and rain storm visited southern Michigan. The damage done at Grand Haven was estimated at $20,000.

15th.—A minor tornado, or what might be called an overgrown whirlwind, was observed about 2 miles north of Hartsville, S. C. One dwelling was blown down, and one person injured. The whirlwind's path was about 300 feet wide and 3 or 4 miles long; loss insignificant. Cincinnati, Ohio, was visited by a severe thunderstorm. The damage was confined principally to telephone wires, trees, awnings, truck and flower gardens, and suburban roads. A series of severe thunderstorms swept over the portions of West Virginia bordering on the Ohio River, from Parkersburg to the upper end of the Pan Handle, and extending back into the interior as far as Lewis and Harrison counties. Houses, bridges, and sawmills were swept away on the headwaters of the upper Little Kanawha, and on other streams emptying into the Ohio. The rainfall was very heavy throughout Ohio, east Tennessee, and western Pennsylvania. At Pittsburg the rain was very heavy. The street car lines, with but one exception, were wrecked, and considerable damage was done to houses and their contents by flooding. The early newspaper accounts of the damage done in Pittsburg were much exaggerated.

19th.—Damaging hailstorms were reported a few miles north of Aberdeen, S. Dak.

23d.—General rains fell over Illinois on this date. In a few cases the winds were unusually strong, and considerable damage was done to the crops, fences, and standing timber.

25th.—An incipient tornado or waterspout was observed in the suburbs of New Orleans. The damage done was insignificant, and the tornado disappeared in the direction of Lake Pontchartrain.

26th.—An unusually destructive hailstorm passed over a strip of country about 60 miles in length, and from 5 to 10 miles in width, in the southeastern part of South Dakota. The storm originated in the eastern part of Bon Homme County, traveled southeast through the counties of Yankton, Clay, and Union, across the Big Sioux River near Akron, and was last reported in the northwestern part of Plymouth County, Iowa.

Another destructive hailstorm passed through Jerauld County, S. Dak., destroying every vestige of crops in its path, in a strip about 20 miles long and 4 miles wide. The damage in the last-named county was estimated at $25,000; the damage in Yankton County was estimated at $100,000; no reports have been received as regards the damage in Clay and Union

counties. Following is a description of the storm in Yankton County, by Mr. Henry G. B. Swinhoe, station agent, Weather Bureau, Yankton, S. Dak.:

I have the honor to report that a hailstorm of great severity occurred in this locality yesterday (July 26), doing an immense amount of damage, estimated in this county alone at $100,000. The path of the storm included the best farming section of the county, from Lesterville on the west to Gayville on the east, and varying in width from 5 to 10 miles. This portion is practically laid waste, a few spots being less seriously damaged. The crops were beaten into the ground, the leaves and branches were stripped from the trees, and numbers of hogs and chickens were killed. Probably a small portion of the oats, which were in shock, may be saved; but the wheat, standing in the field, is completely destroyed where the hail occurred, and the thousands of acres of fine corn are now reduced to leafless stumps. The crops were the best that have been raised here for the last five or six years, and the loss to many of the farmers will be irreparable. Many specimens of hailstones and broken corn stalks were brought in by farmers this morning. Some of the stones measured 1½ inches in diameter sixteen hours after they had fallen; they were of very rugged appearance. Farmers from the worst part of the storm report a sea of ice and mud many miles in extent, the hail in the ravines being 2 feet in depth. The storm appeared to travel from east to west several miles north of Yankton during the forenoon of Sunday, the atmosphere being very sultry, and a light breeze from the southeast. The storm appeared to remain stationary in the northwest till between 2 and 3 p. m., when it commenced to approach, and at the same time divided into two parts, one going south into Nebraska, and the other going east, at about 4 miles north of Yankton. This station, lying between the two main parts of the storm, received 0.74 of an inch of rain, and a maximum wind velocity of 38 miles per hour. No hail fell here, and no damage was done. The temperature was highest (86.9°) about one hour before the storm; during the storm the temperature fell to 64.5°. The color of the clouds in the distance was an inky black, changing on a near approach to a dark green, while the roar of the hail sounded at this station like distant thunder. I am told that some of the hailstones weighed 1 pound, twenty hours after the storm. They were composed of a number of very hard lumps of ice about one-half inch in diameter each, held together by soft ice, forming a mass sometimes 3 inches in diameter. Large holes were made through shingle roofs, and the overhanging eaves of buildings were chipped off.

In Iowa, Nebraska, and South Dakota crops were also damaged by wind, rain, and hail. The storm was unusually severe in Marshall Co., Iowa. At St. Anthony, Albion, and Green Mountain a number of buildings were wrecked. One person was severely injured at Albion. The property loss will probably aggregate $10,000. The greatest damage by hail in Iowa was in Ida, Sac, and Cherokee counties. Severe local storms occurred in southern Michigan, the destruction being greatest in the vicinity of Homer, Three Rivers, Battle Creek, and Northville; other points also suffered.

27th.—The 26th and 27th were days of unusual storm frequency. Iowa, Wisconsin, and Michigan were visited by severe local storms on the 26th, and Indiana, Illinois, Ohio, Pennsylvania, Maryland, New Jersey, and New York on the 27th. These storms seemed to develop simultaneously over large areas, although a progressive movement from west to east was noticed in some cases. The storms in Ohio and western Pennsylvania were unusually severe. At Columbus, Ohio, buildings were unroofed and otherwise damaged by the wind. At Pittsburg, Pa., 2 persons were killed and 7 injured. The damages by wind and flood were very great. The storms did but little damage in central Pennsylvania, but throughout the eastern portion of the State and in New Jersey they were quite severe. An incipient tornado cloud was seen at Gibson City, Ill.; the funnel did not reach to the earth.

28th.—Hail of great size fell in and about Montpelier, Ind., damaging crops and killing live stock.

29th.—A minor tornado occurred at Gloucester, Ohio, at 7.55 p. m., central time. One person was killed and 10 were injured. Property loss about $4,000. The storm moved northeast then southeast in a path 150 yards wide and 1¼ miles long. A severe wind and thunderstorm, in which the wind was said to have a whirling motion counter clockwise, occurred at Huntington, Ind. Three persons were injured. The storm's path was very irregular; it was reported as moving first from west to east, then southeast and finally northeast; its path was from one-quarter to one-half mile wide and 15 miles long. Property loss (buildings only) probably not over $3,000. A destructive hailstorm originated in the central part of Edmunds Co., S. Dak., near Ipswich; passing southeast, destroying the crops and breaking the glass in a great number of windows in its course to the eastern part of Spink County. The path of greatest destruction was about 5 miles wide and 20 miles long.

Casualties during the month by lightning, 87.

TEMPERATURE OF THE AIR.

[In degrees Fahrenheit.]

The mean temperature is given for each station in Table II, for voluntary observers. Both the mean temperatures and the departures from the normal are given in Table I for the regular stations of the Weather Bureau.

The *monthly mean temperatures* published in Table I, for the regular stations of the Weather Bureau, are the simple means of all the daily maxima and minima; for voluntary stations a variety of methods of computation is necessarily allowed, as shown by the notes appended to Table II.

The *regular diurnal period* in temperature is shown by the hourly means given in Table V for 29 stations selected out of 82 that maintain continuous thermograph records.

The *distribution of the observed monthly mean* temperature of the air over the United States and Canada is shown by the dotted isotherms on Chart IV; the lines are drawn over the Rocky Mountain Plateau Region, although the temperatures have not been reduced to sea level, and the isotherms, therefore, relate to the average surface of the country occupied by our observers; such isotherms are controlled largely by the local topography, and should be drawn and studied in connection with a contour map.

The *highest mean temperatures* were: Yuma, 91.3; Phœnix, 88.0; Shreveport and Fort Smith, 84.6; Little Rock, 84.2; Galveston, 83.6; San Antonio, 83.4; Palestine, 83.4; New Orleans, 82.8; Savannah and Port Eads, 82.6; Charleston and Memphis, 82.4; Key West, 82.3. The lowest mean temperatures were: Tatoosh Island, 57.0; Fort Canby, 61.2; Eastport, 62.2. Among the Canadian stations the highest were: Spences Bridge, 74.6; Medicine Hat, 70.2; Toronto, 68.2; Port Stanley, 68.0; Kingston, 67.4. The lowest were: Father Point, 58.0; Banff and Esquimault, 58.6.

As compared with the normal for July the mean temperature for the current month was in excess in portions of the lower Lake Region and south Atlantic Coast, as also over New England, the northern Plateau Region and Missouri Valley. It was deficient especially in the northern and southern Slope and Pacific Coast Region. The greatest excesses were: Roseburg, 4.8; Calgary and Spokane, 4.2; Walla Walla, 3.9; Sacramento, 3.3; Chatham, 3.2; Baker City, 3.1; Swift Current and Fresno, 2.8; Medicine Hat, 2.7. The greatest deficits were: El Paso, 4.2; Williston, 2.6; Omaha, 2.5; Santa Fe, 2.4; Jupiter, 2.3; Huron and Sioux City, 2.2.

Considered by districts the mean temperatures for the current month show departures from the normal as given in Table I. The greatest positive departures were: Northern Plateau, 3.3; north Pacific, 2.3; middle Pacific, 2.2. The greatest negative departures were: Florida Peninsula, 2.0; southern Plateau, 2.1.

The *years of highest and lowest mean temperatures* for July are shown in Table I of the REVIEW for July, 1894. The mean temperature for the current month was the highest on record at: Fresno, 85.5; Fort Smith, 84.6; Little Rock, 84.2; Walla Walla, 79.1; Sacramento, 76.5; Winnemucca, 73.4; Spokane, 73.2; Roseburg, 71.3; Idaho Falls, 69.6; Carson City, 69.3; Astoria, 64.1; Fort Canby, 61.2; Port Angeles, 58.9. The mean temperature for the current month